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| ART UNIT | PAPER NUMBER |
|---|---|
| 2813 | |

DATE MAILED: 03/08/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/071,425 | GILTON ET AL. | |
| | Examiner | Art Unit | |
| | Thanhha Pham | 2813 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *21 November 2003*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-35* is/are pending in the application.

4a) Of the above claim(s) *20-23* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-19 and 24-35* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *11/21/03*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

This Office Action responses to Applicant's Amendment dated 11/21/03.

### *Election/Restrictions*

1. This application contains claims 20-23 drawn to an invention nonelected in the paper dated 07/23/2003. A complete reply to the final rejection must include cancelation of nonelected claims or other appropriate action (37 CFR 1.144) See MPEP § 821.01.

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

**2. Claims 1-3, 5-9, 13, 24, and 26, are rejected under 35 U.S.C. 103(a) as being unpatentable over Makoto Nakase [JP 60226123].**

➢ With respect to claim 1, Makoto Nakase (figs 3's) substantially discloses the claimed semiconductor processing method comprising:

forming an antireflective coating comprising Ge and Se (9, fig 3b, abstract: layer 9 of Se-Ge would have antireflective characteristic) over a substrate (1/8) to be patterned;

forming photoresist (4, fig 3b) over the antireflective coating (9), the photoresist being different from the antireflective coating (fig 3b-3d: the antireflective coating 9 is etched selectively to the photoresist 4);

exposing the photoresist to actinic radiation effective to pattern the photoresist (4, fig 3b abstract: the positive photoresist is exposed to a projection type apparatus for developing in sequent step of forming the patterned photoresist 4), the antireflective coating (6) reducing reflection of actinic radiation during the exposing than would otherwise occur under identical conditions in the absence of the antireflective coating (see figs 3b: the layer Ge-Se 9 would reduce reflection of actinic radiation during the exposure proscess); and

after the exposing, patterning the substrate (1/8, figs 3c-3e) through openings in the photoresist (4) and the antireflective coating (9) using the photoresist (4) and the antireflective coating (9) as a mask.

Nakase Makoto does not expressly teach the antireflective coating having a total thickness which is less than that of photoresist.

However, the claimed range of the antireflective coating relative to the photoresist thickness is considered to involve optimization while has been held to be within the level of ordinary skill in the art. As noted in In re Aller 105 USPQ233, 255 (CCPA 1995), the selection of reaction parameters such as temperature and concentration would have been obvious.

> "Normally, it is to be expected that a change in temperature, or in concentration, or in both, would be an unpatentable modification. Under some

circumstances, however, changes such as these may be impart patentability to a process if the particular ranges claimed produce a new and unexpected result which is different in kind and not merely degree from the results of the prior art...such ranges are termed "critical ranges and the applicant has the burden of proving such criticality... More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation."

*See also In re Waite 77 USPQ 586 (CCPA 1948); In re Scherl 70 USPQ 204 (CCPA 1946); In re Irmscher 66 USPQ 314 (CCPA 1945); In re Norman 66 USPQ 308 (CCPA 1945); In re Swenson 56 USPQ 372 (CCPA 1942); In re Sola 25 USPQ 433 (CCPA 1935); In re Dreyfus 24 USPQ 52 (CCPA 1934).*

➢ With respect to claim 13, Makoto Nakase (figs 3's) substantially discloses the claimed semiconductor processing method comprising:

forming an antireflective coating comprising Ge and Se (9, fig 3b, abstract: layer 9 of Se-Ge would have antireflective characteristic) over a substrate (1/8) to be patterned;

forming photoresist (4, fig 3b) over the antireflective coating (9), the photoresist being different from the antireflective coating (fig 3b-3d: the antireflective coating 9 is etched selectively to the photoresist 4);

exposing the photoresist to actinic radiation effective to pattern the photoresist (4, fig 3b abstract: the positive photoresist is exposed to a projection type apparatus for developing in sequent step of forming the patterned photoresist 4), the antireflective

coating (6) reducing reflection of actinic radiation during the exposing than would otherwise occur under identical conditions in the absence of the antireflective coating (see figs 3b: the layer Ge-Se 9 would reduce reflection of actinic radiation during the exposure proscess); and

after the exposing, patterning the substrate (1/8, figs 3c-3e) through openings in the photoresist (4) and the antireflective coating (9) using the photoresist (4) and the antireflective coating (9) as a mask.

Nakase Makoto does not expressly teach the antireflective coating comprising at least 30 atomic percent Ge and at least 50 atomic percent Se, the antireflective coating having a total thickness which is less than that of photoresist.

However, the claimed ranges of composition of the antireflective coating and the claimed range thickness of the antireflective coating relative to the photoresist thickness are considered to involve optimization while has been held to be within the level of ordinary skill in the art. See *In re Aller 105 USPQ233, 255 (CCPA 1995); In re Waite 77 USPQ 586 (CCPA 1948); In re Scherl 70 USPQ 204 (CCPA 1946); In re Irmscher 66 USPQ 314 (CCPA 1945); In re Norman 66 USPQ 308 (CCPA 1945); In re Swenson 56 USPQ 372 (CCPA 1942); In re Sola 25 USPQ 433 (CCPA 1935); In re Dreyfus 24 USPQ 52 (CCPA 1934).*

➢ With respect to claims 2 and 24, Makoto Nakase (abstract) discloses the antireflective coating (9 ) consists essentially of Ge and Se.

➢ With respect to claims 3 and 5-7, the claimed ranges of percentages of Ge and Se in the antireflective coating are considered to involve optimization while has been

held to be within the level of ordinary skill in the art. See *In re Aller 105 USPQ233, 255 (CCPA 1995); In re Waite 77 USPQ 586 (CCPA 1948); In re Scherl 70 USPQ 204 (CCPA 1946); In re Irmscher 66 USPQ 314 (CCPA 1945); In re Norman 66 USPQ 308 (CCPA 1945); In re Swenson 56 USPQ 372 (CCPA 1942); In re Sola 25 USPQ 433 (CCPA 1935); In re Dreyfus 24 USPQ 52 (CCPA 1934).*

➢ With respect to claim 8, Makoto Nakase (fig 3b) teaches the photoresist (4) contacts the antireflective coating (9).

➢ With respect to claims 9 and 26, Makoto Nakase (figs 3d-3e) teaches patterning the substrate (1/8) comprises subtractive etching (portions of substrate 1/8 in fig 3d are subtracted from the orginal substrate 1/8 in fig 3c by patterning/etching).

**3. Claims 1-19 and 24-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshikawa et al [US 4,320,191].**

➢ With respect to claim 1, Yoshikawa et al (figs 1-9 and col 1-6) substantially discloses the claimed semiconductor processing method comprising:

forming an antireflective coating comprising Ge and Se (2, fig 1, col 1 lines 42-43 and col 2 lines 59-60: layer 2 of $Se_{75}Ge_{25}$ would have antireflective characteristic) over a substrate (1) to be patterned;

forming photoresist (3, fig 1) over the antireflective coating (2), the photoresist being different from the antireflective coating (the photoresist 3 comprised of Ag would be different to the antireflective coating $Se_{75}Ge_{25}$) ;

exposing the photoresist (3, fig 2, col 2 lines 67-68 and col 3 lines 1) to actinic radiation (light 6 from Hg lamp) effective to pattern the photoresist (3), the antireflective

coating (2) reducing reflection of actinic radiation during the exposing than would otherwise occur under identical conditions in the absence of the antireflective coating (see figs 1-2: the layer $Se_{75}Ge_{25}$ 2 would reduce reflection of actinic radiation during the exposure to the light 6); and

after the exposing, patterning the substrate through openings in the photoresist and the antireflective coating using the photoresist and the antireflective coating as a mask (figs 5-6; the substrate (1) is subtractively etched through openings in the photoresist and antireflective coating 21 – mixture of the photoresist 3 and the antireflective coating 21).

Yoshikawa et al does not expressly teach the antireflective coating having a total thickness which is less than that of photoresist.

However, the claimed range of the antireflective coating relative to the photoresist thickness is considered to involve optimization while has been held to be within the level of ordinary skill in the art. See *In re Aller 105 USPQ233, 255 (CCPA 1995); In re Waite 77 USPQ 586 (CCPA 1948); In re Scherl 70 USPQ 204 (CCPA 1946); In re Irmscher 66 USPQ 314 (CCPA 1945); In re Norman 66 USPQ 308 (CCPA 1945); In re Swenson 56 USPQ 372 (CCPA 1942); In re Sola 25 USPQ 433 (CCPA 1935); In re Dreyfus 24 USPQ 52 (CCPA 1934).*

➢ With respect to claim 13, Yoshikawa et al (figs 1-9 and col 1-6) substantially discloses the claimed semiconductor processing method comprising:

forming an antireflective coating comprising Ge and Se (2, fig 1, col 1 lines 42-43 and col 2 lines 59-60: layer 2 of $Se_{75}Ge_{25}$ would have antireflective characteristic) over a substrate (1) to be patterned;

forming photoresist (3, fig 1) over the antireflective coating (2), the photoresist being different from the antireflective coating (the photoresist 3 comprised of Ag would be different to the antireflective coating $Se_{75}Ge_{25}$);

exposing the photoresist (3, fig 2, col 2 lines 67-68 and col 3 lines 1) to actinic radiation (light 6 from Hg lamp) effective to pattern the photoresist (3), the antireflective coating (2) reducing reflection of actinic radiation during the exposing than would otherwise occur under identical conditions in the absence of the antireflective coating (see figs 1-2: the layer $Se_{75}Ge_{25}$ 2 would reduce reflection of actinic radiation during the exposure to the light 6); and

after the exposing, patterning the substrate through openings in the photoresist and the antireflective coating using the photoresist and the antireflective coating as a mask (figs 5-6; the substrate (1) is subtractively etched through openings in the photoresist and antireflective coating 21 – mixture of the photoresist 3 and the antireflective coating 21).

Yoshikawa et al does not expressly teach the antireflective coating comprising at least 30% Ge and at least 50%Se. Instead, Yoshikawa et al discloses the percentages of Ge and Se that is very close to the claimed percentages of Ge and Se (Yoshikawa et al: 25% Ge and 75% Se). Yoshikawa et al also does not expressly teach the thickness of the antireflective coating being less than the photoresist thickness.

However, the claimed percentages of Ge and Se in the antireflective coating 2 of Yoshikawa et al and the claimed range thickness of the antireflective coating are considered to involve routine optimization while has been held to be within the level of ordinary skill in the art. See *In re Aller 105 USPQ233, 255 (CCPA 1995); In re Waite 77 USPQ 586 (CCPA 1948); In re Scherl 70 USPQ 204 (CCPA 1946); In re Irmscher 66 USPQ 314 (CCPA 1945); In re Norman 66 USPQ 308 (CCPA 1945); In re Swenson 56 USPQ 372 (CCPA 1942); In re Sola 25 USPQ 433 (CCPA 1935); In re Dreyfus 24 USPQ 52 (CCPA 1934).*

➢ With respect to claim 28, Yoshikawa et al (figs 1-9 and col 1-6) substantially discloses the claimed semiconductor processing method comprising:

forming a silicon nitride comprising layer over a substrate (1, fig 1, col 4 lines 13-18);

forming an antireflective coating comprising Ge and Se (2, fig 1, col 1 lines 42-43 and col 2 lines 59-60: layer 2 of $Se_{75}Ge_{25}$ would have antireflective characteristic) over the silicon nitride comprising layer (substrate 1 having the silicon nitride thereon);

forming photoresist (3, fig 1) over the antireflective coating (2), the photoresist being different from the antireflective coating (the photoresist 3 comprised of Ag would be different to the antireflective coating $Se_{75}Ge_{25}$);

exposing the photoresist (3, fig 2, col 2 lines 67-68 and col 3 lines 1) to actinic radiation (light 6 from Hg lamp) effective to pattern the photoresist (3), the antireflective coating (2) reducing reflection of actinic radiation during the exposing than would otherwise occur under identical conditions in the absence of the antireflective coating

(see figs 1-2: the layer $Se_{75}Ge_{25}$ 2 would reduce reflection of actinic radiation during the exposure to the light 6); and

after the exposing, subtractively etching the silicon nitride comprising layer through openings in the photoresist and the antireflective coating using the photoresist and the antireflective coating as a mask (figs 5-6, col 4 lines 13-18: the substrate (1) comprising the silicon nitride thereon is subtractively etched through openings in the photoresist and antireflective coating 21).

Yoshikawa et al does not expressly teach the antireflective coating having a total thickness which is less than that of photoresist.

However, the claimed range of the antireflective coating relative to the photoresist thickness is considered to involve optimization while has been held to be within the level of ordinary skill in the art. See *In re Aller 105 USPQ233, 255 (CCPA 1995); In re Waite 77 USPQ 586 (CCPA 1948); In re Scherl 70 USPQ 204 (CCPA 1946); In re Irmscher 66 USPQ 314 (CCPA 1945); In re Norman 66 USPQ 308 (CCPA 1945); In re Swenson 56 USPQ 372 (CCPA 1942); In re Sola 25 USPQ 433 (CCPA 1935); In re Dreyfus 24 USPQ 52 (CCPA 1934).*

➢ With respect to claims 2, 24 and 30, Yoshikawa et al teaches the antireflective coating (2, $Se_{75}Ge_{25}$ ) consists essentially of Ge and Se.

➢ With respect to claims 3, 5-7, 15 and 31-33, claimed ranges percentages of Se and Ge in the antireflective coating and the claimed range temperature for dry etching the antireflective coating are considered to involve routine optimization of experimentation. See In re Aller 105 USPQ233, 255 (CCPA 1995); In re Waite 77

USPQ 586 (CCPA 1948); In re Scherl 70 USPQ 204 (CCPA 1946); In re Irmscher 66 USPQ 314 (CCPA 1945); In re Norman 66 USPQ 308 (CCPA 1945); In re Swenson 56 USPQ 372 (CCPA 1942); In re Sola 25 USPQ 433 (CCPA 1935); In re Dreyfus 24 USPQ 52 (CCPA 1934).

➢ With respect to claims 4 and 25, Yoshikawa et al (col 2 lines 59-62) teaches the antireflective coating is substantially amorphous.

➢ With respect to claim 8, Yoshikawa et al (fig 1) teaches the photoresist (3) contacts the antireflective coating (2, $Se_{75}Ge_2$ ).

➢ With respect to claims 9 and 26, Yoshikawa et al (figs 5-6, col 4 lines 13-18) teaches patterning the substrate (1) comprises subtractive etching (portions of substrate 1 in fig 6 are subtracted from the orginal substrate 1 in fig 5 by patterning/etching).

➢ With respect to claims 10, 27 and 29, Yoshikawa et al (figs 6-7) teaches, after the patterning, removing substantially all the photoresist and antireflective coating layer (21) from the substrate (1).

➢ With respect to claims 11, 14 and 34, Yoshikawa et al (figs 3-5) teaches the openings in the photoresist and the antireflective coating (21, fig 5) are formed by solvent processing of the photoresist (figs 3-4, col 1 lines 51-53) after the exposing to form the photoresist openings , followed by dry etching of the antireflective coating (22, figs 4-5, col 3 lines 5-9 & 52-56) through the photoresist openings.

➢ With respect to claims 12, 16-17 and 35, Yoshikawa et al (figs 1-5) teaches forming the openings in the antireflective coating comprises after said exposing (figs 1-2: after the photoresist 3 is exposed by the light 6 from the Hg lamp), exposing the

coating through the photoresist to radiation having a wavelength from about 190 nanometers to about 450 nanometers (figs 1-2: after the photoresist 3 is exposed by the light 6 from the Hg lamp, the antireflective coating 2 is also exposed to the radiation of light 6 form Hg lamp; since light 6 is from the Hg lamp, light 6 has a wavelength from about 190-450 nm; therefore, the antiflective coating 2 is also exposed to the radiation having a wavelength from about 190 nanometers to about 450 nanometers), and thereafter dry etching the antireflective coating (21/22) in an oxygen comprising ambient (col 3 lines 52-56).

➢ With respect to claimed 18, the exposing of the antireflective coating through the photoresist to radiation having a wavelength from about 190 nanometers to about 450 nanometers occurs after said solvent processing of the photoresist is obvious for those skilled in the art. Selection of any order of performing process steps is prima facie obvious in the absence of new or unexpected results In re Burhans, 154 F.2d 690, 69 USPQ 330 (CCPA 1946).

➢ With respect to claim 19, selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in Sinclair & Carroll Co., Inc. v. Interchemical Corp. , 325 U.S. 327, 65 USPQ 297 (1945) "Reading a list and selecting a known compound to meet known requirements is no more ingenious than selecting the last piece to put in the last opening in a jig - saw puzzle." 65 USPQ at 301.).

***Response to Arguments***

4. Applicant's arguments filed 11/21/03 have been fully considered but they are not persuasive.

Regarding to Applicant's argument on pages 11-12, Applicant argues that Yoshikawa et al does not discloses the antireflective coating comprising Ge and Se. The argument is not persuasive since Yoshikawa et al the layer 2 of $Se_{75}Ge_{25}$ comprised of Se and Ge as being claimed. Moreover, percentages of Ge and Se of layer 2 of Yoshikawa is very closed to the percentage composition of Ge and Se, the layer 2 of Yoshikawa et al of $Se_{75}Ge_{25}$ must have a characteristic of the antireflective coating. Applicant is respectfully suggested to prove otherwise.

Regarding to Applicant's argument on page 12, Applicant argues that Japanese reference does not ultilize the antireflective coating comprising Ge and Se. The argument is not persuasive since the layer 9 of the Japanese reference consist essentially of Ge and Se, the same as Applicant's invention. The layer 9 of the Japanese reference should have a characteristic of the antireflective coating. Applicant is respectfully suggested to prove otherwise.

Regarding to Applicant's argument about the claimed thickness of the antireflective coating relative to the photoresist, the claimed range is obvious for those skilled in the art as an experimental optimization since Applicant's specification does not show the criticality of such range.

***Conclusion***

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanhha Pham whose telephone number is (571) 272-1696 . The examiner can normally be reached on Monday-Thursday 8:00 AM - 7:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead Jr., can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is (703) 308-3432.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Thanhha Pham

JACK CHEN
PRIMARY EXAMINER